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CONTAINERIZED, TRANSPORTABLE BUILDING STRUCTURE  
AND METHOD OF ASSEMBLY

BACKGROUND OF THE INVENTION

5           The present invention generally relates to transportable multi-level building structures. More particularly, the illustrated apparatus is in the form of a multi-level building structure of a scale which will accommodate human beings. The structure is assembled from a plurality of specially designed transformable container units that simulate and serve as shipping containers meeting ISO specifications. It is capable of  
10           being opened and assembled on-site with minimal complexity and man hours.

          There exist many situations where temporary or transportable housing is needed. For example, during natural disasters people are often displace from their homes. During times of military conflict, barracks, MASH and other buildings are required, often in remote locations. Other situations include temporary offices, such  
15           as on-site construction offices and the like.

          In the past, tents have widely been used as temporary shelter during natural disasters. However, it will be readily understood that these structures are incapable of suitably housing individuals or families for a prolonged period of time. Furthermore, tents do not provide the comforts of living, particularly in adverse weather conditions.

20           In other instances, pre-fabricated self-contained buildings, often referred to as mobile homes, are used. While such mobile homes provide the comfort of living and allow prolonged use, they are very costly. In addition, although such mobile homes are often transportable to a site via a trailer attached to a semi-truck, such mobile homes are often unwieldy and difficult to transport. Moreover, such mobile homes  
25           are typically not able to be conveniently transported by rail, air, or ships. As the primary means of transporting such mobile homes is via trailer truck, the width of such mobile homes is limited by the space available on a road, typically eight feet. Of course, mobile homes can be provided as "double-wide" units, wherein one-half of the unit is transported by separate trailer trucks. However, this increases the complexity  
30           and cost of transporting the mobile home unit.

          Accordingly, there is a continuing need for buildings which can be transported via various traditional means in a convenient fashion. Such buildings should be capable of being assembled with minimal machinery and man hours. Preferably, such building units should be capable of being much larger than their containerized kit. The  
35           present invention fulfills these needs and provides other related advantages.

### BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings illustrate the invention. In such drawings:

Figures 1-7 schematically illustrate the assembly of a two-level building from a pair of like shipping containers in accordance with a presently preferred embodiment of the invention;

Figure 8 schematically illustrates an alternative presently preferred embodiment of the invention.

Figure 9 schematically illustrates four shipping containers stacked to provide a four level building structure.

### DETAILED DESCRIPTION OF THE DISCLOSURE

Figures 1 through 7 schematically illustrate utilizing a plurality of like, stackable, shipping containers to construct a multi-level building structure. This apparatus and the method of construction/assembly represent a presently preferred embodiment of the invention.

Figure 1 illustrates a pair the shipping containers 10 stacked, one on top of the other, at the construction site. They may be brought to the site by truck or the like, and have been stacked by the use of a suitable lifter/mover such as a crane.

In general, each of the illustrated shipping containers 10a, 10b has a generally rectangular structural center frame 12. More particularly, each illustrated center frame 12 includes a base 14 having a pair of long side members 16 and a pair of short end members 18. The frame 12 also includes a top 20 having a pair of long side members 22 and a pair of short end members 24. There are also upright structural frame corner members 26 that connect the four corners the frame base 14 to the respective four corners of the frame top 20, and provide support for the frame top. Further, as shown in Fig. 2, there is an upright structural frame center member 28 that extends between each base long side member 16 and the adjacent top long side member 22 midway between the ends of the container to provide added structural support. The frame top 20 may be reinforced by a horizontal structural frame center member 30 ( shown only for the upper stacked container 10b ) that extends between the top long side members 22 generally midway between ends of the container. Similarly, the frame base 14 may be reinforced by a horizontal structural frame center member (not shown) that extends between the base long side members 16 generally midway between ends of the container. These horizontal center frame members 30 are generally aligned with the upright frame center members 28. The illustrated frame may be constructed of various suitable materials such as metal, wood, or rigid high-strength plastic.

Suitable wall sections or panels are secured by usual means to portions of the center frame 12 to provide exterior walls for the associated closed shipping container

10. The illustrated wall sections or panels may be constructed of suitable materials which are desirable way lightweight yet durable. By way of example, the wall sections or panels may be made from wood, plywood, plastic in foam or other form, etc.

5 In the illustrated container, there are base sections or panels 38 that provide the exterior base or bottom wall 48, end wall sections or panels 40 that provide the exterior end walls 49, and top sections or panels 44 that provide the exterior top wall 51 (shown only for the upper container 10b). The center frame 12 together with the base wall 48, the end walls 49 and the top wall 51 define the center portion of the building structure. Extending or enlarging portions of the building structure will be described below.

10 As seen best in Fig. 2, each of the containers 10a, 10b also has a pair of rectangular side frame sections 32. Each of the illustrated rectangular side frame sections 32 has a pair of short end members 34 and a pair of long members 36. Side wall sections or panels 42 are secured by usual means to the sidewall frame sections 32 to provide exterior side walls 46. When the side walls 46 are in the close shipping position shown in Fig. 1, the side walls are generally upright. Thus, for each sidewall 46, one of the long frame members 36a of its side frame section 32 is at the top and the other of the long frame members 36b is at the bottom. Each long frame member 36b at the bottom is hinged to the adjacent long side member 16 of the frame center base 14 so that the side wall or floor extender section 46 can be pivoted/lowered to the opened, extended position shown in Fig. 2. Each side wall or floor extender section or wall 46 thus forms an extended floor portion.

15 Figure 2 illustrates both side walls 46 in the opened, extended position. In this position, the side walls or floor extender portions 46 are generally horizontally aligned with the center base 48. Sections 46 provide extended floor portions that combine with the base 48 to form an enlarged generally flat horizontal floor. During shipment, the side walls 46 are releasably, but securely, fastened in the upright, close position by suitable means such as releasable clamps (not shown).

20 The base, end, and top exterior walls 48, 49 and 51 remain in position when the shipping container is opened and assembled, as shown in Fig. 2, to provide, respectively, the floor, the end walls and the top or ceiling for the level provided by that shipping container. The center frame 12 of each container provides structural support for its level, as well as for levels above it.

25 As noted above, during assembly, the side walls or floor extender sections 46, which are each comprised of their side wall panels 38 and their side frame section 32, are released and pivoted to their opened, extended positions as shown in Fig. 2. The base 48, which is comprised of the frame center base 14 and the base panels 38, and the opened sidewalls 46, rests upon a suitable supporting surface, which may be the

ground or a foundation, in a generally level horizontal position. When the side walls 46 are opened, they are no longer contributing to the structural support of the center portion of the building structure. However, it will be noted that that center portion of the building structure remains well supported by the center frame, particularly the upright frame members 26, 28 which in turn are supported by the frame center base 14.

When the side walls 46 are lowered, the sides of its container are thereby fully opened to provide easy access to the interior of the container. Each container holds additional components for the construction of the final building structure as will be described below.

Figure 3 illustrates the next step in the assembly of the illustrated multilevel building structure. Upright structural support posts or members 50 are positioned and secured at each outer corner of each open side wall 46 and at the outer edge of each side wall intermediate its ends. These upright structural posts 50 are secured to the frame members 34, 36 of the side wall frame sections 32 by suitable means such as flanges secured by nuts and bolts( not shown)..

Next, as shown in Figure 4, the side walls or floor extender sections 46b for the second or upper shipping container 10b are released and pivoted to their opened, extended positions generally horizontally aligned with the base 48b of that upper container. As with the lower-level, each of the side walls 46b for the upper level forms an extended floor portion that serves to provide an enlarged floor for that upper level. They also provide enlarged ceiling portions for the lower level that are generally coextensive and vertically aligned or overlying the extended floor portions of the lower level floor created by its open extended side walls 46. Upright posts 50b are secured to the frame of the upper-level open side walls 46b by suitable connection means such as flanges, nuts and bolts (not shown).

As shown in Figure 4, at this stage of assembly the contents of the two containers remain in place aside from the lowering and extending of the side walls. If a third level were to be added to this building structure, a like third shipping container it would have been initially stacked atop the second container. In such case, upright structural support posts or members 50 as were used at the lowest level would be attached to the frame/floor of the second level and the side walls 46 of the third container would be released and lowered so as to extend over those second level posts 50. If there were a fourth or additional levels, the assembly process would proceed as just noted for the third level. Figure 9 illustrates four stacked containers.

Figure 5 illustrates the next step in the assembly/construction. Wall panels or sections 52 packed in the lower level are removed, positioned and attached to complete the side walls for the lower level of the building structure. These panels 52

extend around the extended areas at the lower level provided by the outwardly extending base or floor sections formed by the lowered side walls 46 and 46b. The attachment of the side wall panels 52 may be accomplished by various meanings known in the construction trades. For example, a tongue-and-groove type connection between the panel edge and the adjacent frame member may be used.

If there were three or more levels, the assembly of the side wall panels 52 would preferably await opening of all of the containers. This facilitates ready access to the various containers for components, tools, etc. as they are needed for the assembly of the wall panels.

Thus, the assembled lower level of the building structure comprises the original rectangular center portion provided by and having the size of the shipping container 10, and an enlarging or extended side portion at each side of the center portion. Each of the side portions is defined by the upper and lower level opened, extended side walls or floor extender sections 46, 46b which form the extended floor portions at that side of the structure, and the associated additional side wall panels 52.

Alternatively, as illustrated in Figure 8, in lieu of the upright posts 50 and the separate side wall panels 52, reinforced sidewall panels 52c with integrated frame members (not shown) may be utilized. In this alternate embodiment, before the upper side walls 46b are lowered, the panels 52c would be secured in place. Then the upper side walls 46b would be lowered and secured to the panels 52c.

Figure 6 illustrates the next step which involves additional, individual side wall panels 52b that were packed in the upper shipping container 10b. These panels 52b are removed, positioned and secured to the upper level side wall frame section 32b and to the upper level upright members 26b, 28b, to provide the upright exterior and interior walls for the extension portions of the upper level. Since there is not a third level provided in this embodiment, there are no extended top walls provided by opened side walls 46 for these side wall panels 52b to attach to. Since there is no higher third level, the panels 52b need only support a roof and not another level. This also obviates the need for structural support members at the upper second level.

As shown in Figure 7, the upper edges of these additional sidewall panels 52b are secured to roof panels 54 to provide further rigidity and structure to both the side wall panels 52b and the roof panels 54. It will be noted that, in the illustrated embodiment, as shown in Figure 7, the roof over each extended portion is angled or inclined. To accommodate this incline, certain side wall panels 52b' located at the ends of the structure have inclined upper edges 53. In addition, short upright roof support panels 55 are provided and secured along each side member 22b of frame top 20b of the upper level. These panels 55 connect to and support the elevated inward sides of the inclined roof panels 54.

As also illustrated in Figure 7, additional structure providing a stairway 56 to the upper-level and a landing 58 at upper-level may be secured to the outside of the assembled building structure. One or more doorways 60 are provided in certain of the upper-level side wall panels 52a leading from the upper end of the stairway 56 and/or the landing 58 into the interior of the upper-level.

Desirably the apparatus may be constructed and arranged so that it can be readily disassembled and packed into the shipping container for storage and/or shipment to another site.

The illustrated shipping containers or enclosures desirably meets the ISO approved container specifications. As such, the container is 8'6" tall and 8' wide at its exterior, and is either 20 feet or 40 feet in length so as to meet the standard requirements. The containers can thus be transported and stored as ISO approved shipping containers.

Thus, those skilled in the art, will appreciate that the present invention provides ideal temporary or semi-permanent building use in almost any application, including disaster relief, portable housing, mobile offices, large remote projects, military, decontaminations centers, emergency hospitals, migrant farm housing and classrooms. After the unit has fulfilled its need, it can be disassembled in the same manner it was assembled and closed back up into its original containers. These can be stored without need to worry about vandalism or weathering, or it can be transported to its next destination and used once again. Although the shell of the unit remains virtually unchanged, different materials may be used to adapt to user's needs and the product may be customized depending upon the ultimate use. The present invention includes the benefits of being self-contained, easily transported, re-deployable, and easily stored and secured. Due to the kit-nature of the building unit, the parts may be fully replaceable so as to prevent the need to replace the entire unit.

Although an embodiment has been described in detail for purposes of illustration, various modifications may be made without departing from the scope and spirit of the invention.